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ABSTRACT

The Urban Mathematics Collaborative (UMC) project has the goal of contributing to the improvement of mathematics education in the inner-city schools by identifying models to enhance the professional lives of teachers and encouraging the entry of high school mathematics teachers into a larger mathematics community including mathematicians from higher education and industry. This document is a 4-year site report on the St. Louis UMC from its entry into the program in 1985 through June 1990. The intent is to reflect on the development of the collaborative, noting the changes that have taken place in regard to the context in the collaborative operated, the collaborative's management structure, and the focus of its activities. This final site report addresses the major influences exerted on the collaborative and the directions the collaborative has taken. Some conclusions are reached regarding both the collaborative's development and achievements in light of its specific goals as well as the goals of the total UMC project. (MDH)

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December 1991
Program Report 91-5 SL

ST. LOUIS URBAN MATHEMATICS COLLABORATIVE

FOUR-YEAR SITE REPORT

A Final Report to the Ford Foundation on the Urban Mathematics Collaborative (UMC) Project

Norman L. Webb, Susan D. Pittelman, Thomas A. Romberg, Allan J. Pitman, Edel M. Reilly, and James A. Middleton

Wisconsin Center for Education Research
School of Education, University of Wisconsin–Madison

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Norman L. Webb, Susan D. Pittelman, Thomas A. Romberg, Allan J. Pitman, Edel M. Reilly, and James A. Middleton

Report from the
Urban Mathematics Collaborative Documentation Project

Wisconsin Center for Education Research
School of Education
University of Wisconsin
Madison, Wisconsin

December 1991

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TABLE OF CONTENTS

		Page
I.	Introduction	1
II.	Four-Year Summary: 1986-1990	7
	A. Overview	7
	B. Purpose	8
	C. Context	10
	D. Management Structure	12
	E. Project Activities	16
	F. Reflections	28
References		35

I. INTRODUCTION

This document is a four-year Site Report on the St. Louis Urban Mathematics Collaborative from its inception in 1986 through June 1990. The intent is to reflect on the development of the collaborative, noting the changes that have taken place in regard to the context in which the collaborative operated, the collaborative's management structure, and the focus of its activities. It is not the intent of this report to review the development of the collaborative; this has been done in the annual reports. This final Site Report addresses the major influences exerted on the collaborative and the directions the collaborative has taken. Some conclusions are reached regarding both the collaborative's development and achievements in light of its specific goals as well as the goals of the total Urban Mathematics Collaborative project.

The Urban Mathematics Collaborative Project

In 1984, the Ford Foundation initiated the Urban Mathematics Collaborative (UMC) project to improve mathematics education in inner city schools and to identify new models for meeting the on-going professional needs of urban teachers. In February, 1985, the Foundation awarded five grants to establish urban mathematics collaboratives in Cleveland, Minneapolis-St. Paul, Los Angeles, Philadelphia, and San Francisco. In addition, the Ford Foundation established a Documentation Project at the University of Wisconsin-Madison to chronicle the development of the new collaboratives and a Technical Assistance Project (TAP) at the Education Development Center (EDC) in Newton, Massachusetts, to serve as a source of information for the collaborative projects (Romberg & Pitman, 1985). During the next 18 months, UMC projects were funded in Durham, Pittsburgh, San Diego, St. Louis, Memphis, and New Orleans, for a total of eleven collaboratives (Webb, Pittelman, Romberg, Pitman, Fadell, & Middleton, 1989). In August, 1987, an Outreach Project was funded at EDC to publicize and expand the UMC effort. In August of 1989, the Ford Foundation awarded replication grants to three additional sites: Dayton, Ohio; Columbus, Georgia; and Milwaukee, Wisconsin. In April, 1991, the fifteenth and final collaborative, the Greater Worcester Urban Mathematics Collaborative, was established in Massachusetts. A map indicating the location of UMC projects is presented in Figure 1.

The
Urban Mathematics Collaborative Project

Funded by The Ford Foundation

- **Cleveland Collaborative for Mathematics Education (C^2ME)**
  Cleveland, Ohio
- **Durham Collaborative: The Durham Mathematics Council**
  Durham, North Carolina
- **Los Angeles Urban Mathematics/Science/Technology Collaborative (LAUM/S/TC)**
  Los Angeles, California
- **Memphis Urban Mathematics Collaborative**
  Memphis, Tennessee
- **New Orleans Mathematics Collaborative (NOMC)**
  New Orleans, Louisiana
- **Philadelphia Math Science Collaborative**
  Philadelphia, Pennsylvania
- **Pittsburgh Mathematics Collaborative**
  Pittsburg, Pennsylvania
- **St. Louis Urban Mathematics Collaborative**
  St. Louis, Missouri
- **San Diego Urban Mathematics Collaborative**
  San Diego, California
- **San Francisco Mathematics Collaborative**
  San Francisco, California
- **Twin Cities Urban Mathematics Collaborative**
  Minneapolis-St. Paul, Minnesota

Replication Sites

- **Columbus Regional Mathematics Collaborative (CRMC)**
  Columbus, Georgia
- **Dayton-Montgomery County Public Education Fund Mathematics Collaborative**
  Dayton, Ohio
- **Greater Worcester Urban Mathematics Collaborative**
  Worcester, Massachusetts
- **Milwaukee Metropolitan Mathematics Collaborative (M^3C)**
  Milwaukee, Wisconsin

Figure 1. The National Network of Urban Mathematics Collaboratives.

During the period covered in this Site Report, mathematics education in the United States has changed. When the Ford Foundation initiated the UMC project in 1984, a consolidated effort to reform mathematics had not yet begun, although the potential of the mathematics education community for achieving reform was envisioned. In this regard, the UMC project was innovative in mobilizing a group of inner-city teachers to increase both their sense of professionalism and their connections with mathematicians in the business community and in higher education. Between 1985 and 1990, mathematics education in this country began to change dramatically. In an effort to develop a new mandate based on such studies as *Renewing United States Mathematics: Critical Resource for the Future* (Commission on Physical Sciences, Mathematics, and Resources, 1984) and *A Nation at Risk: The Imperative for Educational Reform* (National Commission on Excellence in Education, 1983), the Mathematical Sciences Education Board in 1989 issued *Everybody Counts: A Report to the Nation on the Future of Mathematics Education* and the National Council of Teachers of Mathematics published *Curriculum and Evaluation Standards for School Mathematics*. As the collaboratives matured, the movement to change mathematics education in the country took on momentum, creating a new environment for the collaborative network. What began as a project designed to enhance the professional development of urban teachers evolved into a catalyst for the reform of mathematics education.

At each site, the UMC project supports collaboration among school mathematics teachers and between teachers and mathematicians from institutions of higher education and industry; it also encourages teacher membership and participation in a broad-based local mathematics community. Although the guiding principle behind the UMC effort has been that the teacher is and will remain at the hub of the educational process, it has become evident that many teachers--and especially those in inner-city schools--are overworked; lack support and material resources; and are isolated from their colleagues, from other professionals, and from the rapidly changing field of mathematics. Thus, the focus of the UMC project remains rooted in the premise that collegiality among professional mathematicians can reduce teachers' sense of isolation, enhance their professional enthusiasm, expose them to a vast array of new developments and trends in mathematics, and encourage innovation in classroom teaching.

Structure of the Four-Year Summary

The Four-Year Summary presented in the following chapter is comprised of six sections. The first section provides a brief overview of the collaborative. In the second section, the purpose of the collaborative is presented, as stated in its proposals to the Ford Foundation. The goals outlined in the collaborative's final request for funds to the Ford Foundation are contrasted with those specified in its initial proposal. The third section discusses the context within which the collaborative operated and the extent to which this remained stable or changed over the four-year period. Topics addressed in this section include demographic information on the surrounding community, changes in school district administration and enrollment and in the teacher population targeted by the collaborative, and significant changes occurring in mathematics and in the professional environment. The fourth section of the report describes the management structure adopted by the collaborative and changes that occurred in that structure during the four years. The fifth section covers the collaborative's activities in relation to four major themes that emerged as dominant in most collaboratives during the documentation process: socialization and networking, increased knowledge of mathematics content, teacher professionalism, and teacher leadership. These themes are used as a focus to organize ideas and to reflect on the collaborative's development with respect to some overriding expectations of the UMC project. The sixth and final section presents the reflections of Documentation Project staff on the approach the collaborative took to achieve its goals and the perceived outcomes in the areas of collaboration, professionalism, and mathematics focus.

The information presented in the Site Report is both a condensation and synthesis of information collected over the span of the UMC Documentation Project. Data were collected through monthly reports, the electronic network, four large-scale surveys, two demographic surveys, site visits, and case studies. These data-collection instruments and procedures are described in detail in the *UMC Guide to Documentation* (Pittelman, Webb, Fadell, Romberg, Pitman, & Sapienza, 1991). Detailed information about the Urban Mathematics Collaborative project is presented in six annual reports, four technical reports, and a set of case studies prepared by the Documentation Project. All of these reports are listed in the References. The Site Reports, which offer a retrospective summary of each collaborative's efforts over the grant period, have not been reviewed by

collaborative personnel and thus present the reflections solely of the Documentation Project staff.

II. FOUR-YEAR SUMMARY: 1986 to 1990

A. Overview

The St. Louis Urban Mathematics Collaborative was one of four collaboratives established when a second group of collaboratives was funded in 1986. The collaborative, which serves the 114 secondary mathematics and computer science teachers and the 85 middle school mathematics teachers in the St. Louis Public Schools, is administered through the Mathematics and Science Education Center (MSEC). The MSEC was established in St. Louis in the fall of 1986 to assist schools and school districts in the administration of mathematics and science programs.

From its beginning, the St. Louis Urban Mathematics Collaborative adopted the philosophy that teachers should have the major role in planning and making decisions for the collaborative. Involved in developing the original proposal, teachers have dominated the Collaborative Council, the decision-making body for the collaborative, and have felt strong ownership in the collaborative from its beginning. The collaborative has been supported by representatives from higher education, demonstrated both through their service on the Council and their willingness to be used as resources; the involvement of the higher education community has helped to highlight the collaborative's importance. One business representative has been very active on the Council, and his company, as well as others in the area, have provided financial support for collaborative activities. The district's mathematics supervisors have been instrumental in advancing the collaborative and serve as the major link with the school district. Although the number of mathematics supervisors has been reduced from three to one, the present supervisor views the collaborative as an important component of the district's mathematics program, enabling her to involve teachers in activities that would not otherwise be possible. Finally, the district administration is fully aware of the collaborative's activities and has given it complete support.

The collaborative's greatest impact has been on the 20 to 30 teachers who have been active on the Collaborative Council and have served on planning committees for the Secondary Mathematics Contest and the Mathematics Fair. These teachers have a real sense of ownership in the collaborative and have benefited from the close working relationship with the other teachers. Nearly all of the other teachers have been involved to

some extent in the collaborative, or at least know about it, but feel somewhat outside the central core of teachers that has formed. However, even with this differentiation in involvement, teachers attribute to the collaborative their increased professional and intellectual growth and their visibility vis-a-vis the district administration and community. Those in business and higher education have been used primarily as resources and have been very willing to support collaborative activities, but in general have not participated actively in the Council's long-range planning for the collaborative.

The St. Louis Urban Mathematics Collaborative has experienced an almost yearly change in its director/coordinator, which has caused problems in continuity and leadership. A consultant was hired by EDC to facilitate the permanence planning process in the spring of 1989. This process provided the collaborative with an outsider's view of what had been achieved and what still needed to be accomplished. It culminated a year later in an approved permanence proposal that outlined ways for the collaborative to become more integrated with the district's mathematics program, gain a higher level of participation from the business, district administration, and higher education communities, and increase the number of teachers actively involved in the collaborative. At the end of the four-year period, the collaborative was entering a new phase in its development. A number of questions were still left to be answered regarding who would provide the leadership and which institution was the most appropriate host agency for the collaborative.

B. Purpose

The target group for the collaborative during its first three years consisted of the approximately 114 secondary mathematics and computer science teachers in the St. Louis Public Schools district. In its fourth year, the district's 85 middle school mathematics teachers became eligible for collaborative participation, and some activities were planned specifically for this population.

At the beginning, the collaborative's four major goals were established by a group that included secondary mathematics teachers. These goals concentrated on bettering teachers' professional lives through accessing more resources, implementing staff

development experiences, improving communications among teachers, and promoting the recognition of teacher achievements. As stated, these goals were:

1. Teachers will explore potential resources among businesses, industries, and universities to find out how these resources may assist them in their own professional growth and in their classroom instruction.

2. Teachers will develop, assist in developing, and implement staff training programs for themselves and for their peers.

3. Teachers will assist in improving communication and exchanges of information among all mathematics teachers within each school and across schools.

4. Teachers will promote the recognition of accomplishments and quality performance among all mathematics teachers and students.

After four years, the initial goals were revised and presented in the proposal for permanence that the collaborative submitted in 1990. A single new goal, which concentrated on the programs and services the collaborative was to provide, succinctly presented the collaborative's objectives:

> To facilitate a wide range of programs and services which enhance mathematics education through professional interaction among mathematics teachers, staff development, curriculum implementation, and community business/industry networks.

In light of this goal, the intent of the collaborative was to increase the number of active teachers and, specifically, to target more preservice teachers as well as novice teachers for collaborative involvement; to increase the support and materials for all district mathematics teachers; and to invite teachers from selected outlying school districts to join collaborative teachers in staff development activities.

This change in purpose reflects a subtle change in the thinking of collaborative members--from a focus on a somewhat self-centered concern with what they as teachers

would be doing to a more cooperative mode of working with others to improve mathematics education. This acknowledges an evolution in the collaborative's development to expand beyond the relatively small core group of 20 to 25 teachers and to become a focal point for mathematics education reform in the St. Louis Public Schools (SLPS) district, which could then extend to other districts.

C. Context

The population of the city of St. Louis declined over the four-year period from over 450,000 in 1986 to nearly 410,000 in 1989. The population of the metropolitan area, however, has remained fairly constant, exceeding 2 million. The school district experienced a 9 percent decline in student enrollment (from 50,908 to 46,128), as well as a decline in the number of schools from 130 in 1985-86 to 122, in 1989-90. The decline in population and student enrollment has not affected the ethnic composition of the student population, which has remained 77 percent black, 21 percent white, 1 percent Asian, and less than 1 percent from other ethnic groups. The yearly dropout rate in St. Louis high schools for the 1989-90 school year was 14.5 percent, up from 13 percent in 1988. A special program funded federally to reduce the number of students who leave school before graduation was introduced in the 1989-90 school year.

In the 1989-90 school year, Dr. Jerome B. Jones was serving his seventh year as district superintendent. At the end of the school year, he submitted his resignation, effective June 30, 1990. Dr. David Mahan, formerly assistant superintendent for middle schools, was appointed as the interim superintendent for 1990-91. There are 8 senior high schools, 21 middle schools, 63 elementary schools, and 30 other schools (including many magnet schools) in the district. The 12-member St. Louis Board of Education oversaw a district budget of nearly $300 million in 1989-90, a 28 percent increase from the 1987-88 budget of $235 million. Forty-two percent of the district's funds comes from local revenues, 48 percent from state funds, and 10 percent from federal sources.

Between 1985 and 1990, the number of teachers employed by the district has decreased by about 8 percent, from 3,806 to 3,500. At the beginning of the 1989-90 school year, budget cuts forced the elimination of 134 support positions, including 2 of the 3 mathematics supervisors. In 1987, teachers' salaries ranged from $19,097 for beginning

teachers with a BA or BS degree to $36,680 for those with a Ph.D. degree; by 1990, this range had increased, from $21,110 up to $40,500. In 1989-90, the average teacher's salary was $29,326. Teachers receive 4 paid inservice days per year over the 185-day school year. The local teachers' union, an affiliate of the American Federation of Labor (AFL/CIO), is the exclusive bargaining agent for the 5,000+ employees in the system. About 72 percent of the teachers are union members.

The ethnic composition of the teaching staff in the SLPS has remained constant at 67 percent black, 32 percent white, and 1 percent from other ethnic groups. The ethnic composition of the initial target group of 114 secondary mathematics and computer science teachers also has remained fairly constant over the duration of the collaborative: about 48 percent black, 48 percent white, and 4 percent from other ethnic groups. Thirty-eight percent of these teachers held master's degrees, 30 percent a master's degree plus 30 hours, and 38 percent bachelor's degrees. In 1990, 91 percent of the secondary mathematics teachers had tenure. In 1989-90, the nearly 85 middle school mathematics teachers became eligible to participate in the collaborative. In this group of teachers, 77 percent were black, 23 percent were white, and less than one percent were from other ethnic groups.

Students are required to pass three units of mathematics to graduate from district high schools, one unit more than is required by the state of Missouri. In 1988-89, 67 percent of the high school students were enrolled in mathematics courses. At the beginning of the 1988-89 school year, a new mathematics curriculum was implemented that required all students to take some algebra prior to graduation. In the standard and college preparation strands, students take algebra in ninth grade. In the gifted strand, students take geometry in ninth grade. For students entering ninth grade who score low on the state-administered test or the California Achievement Test, an Elements of Mathematics course is required prior to taking algebra in the sophomore or junior year.

The St. Louis Public Schools district has operated under court-ordered desegregation since 1980. Part of this order is a voluntary city-county desegregation program, under which any student from an all-black school in the city may transfer to a county district school in which black enrollment is under 25 percent. Approximately 11,000 city students attended county schools during the 1987-88 school year. Since 1986, the district judge has ordered 16 city schools closed and the pupil-to-teacher ratio to be

reduced to 20:1 in the city's all-black schools. As part of the school district's desegregation plan, the district established magnet programs to promote racial integration.

Many institutions in the St. Louis area provide opportunities for the professional development of St. Louis teachers. The Mathematics and Science Education Center sponsored several seminars and symposia for mathematics teachers, including a series of site visits to Sverdrup Corporation where teachers could observe the latest in research and technology. St. Louis teachers have a chance to earn advanced degrees through a variety of programs. An innovative teacher leadership program, The Teacher's Academy, was initiated during the 1989-90 school year. The Academy, sponsored by the Network for Educational Development, offers a fellowship program for classroom teachers with five or more years of experience. Other programs have begun to address, and increase, student achievement. Some of these include the St. Louis Regional Education Partnership, Civic Progress, student incentive programs, and a variety of local corporation programs that provide computer and other resources for student use. In October, 1989, the National Science Foundation ((NSF) awarded $3,700,000 over a five-year period to a consortium of five local institutions, including the St. Louis Public Schools, to establish the St. Louis Regional Science and Technology Career Access Center (RCAC).

D. Management Structure

To initiate an Urban Mathematics Collaborative in St. Louis, the Ford Foundation contacted the Danforth Foundation which, among its other activities, partially funds the Mathematics and Science Education Center (MSEC) in St. Louis. The Ford Foundation was referred to the newly created MSEC as the most appropriate host agency for a St. Louis collaborative. Following a meeting with Barbara Scott Nelson of the Ford Foundation in November, 1985, the MSEC decided to apply for a planning grant. A grant of $2,500 was awarded by the Ford Foundation and a committee was established to write a proposal. The MSEC operates under the auspices of the Network for Education Development, a consortium of cooperating school districts in the St. Louis area. The MSEC is primarily responsible for raising funds for education from businesses in St. Louis and its environs. In addition to the MSEC, the mathematics collaborative has the support of seven corporations, three universities and colleges, and four foundations, as well as several other cultural associations.

The Mathematics and Science Education Center, which was formally initiated in January, 1986, and the collaborative were created almost simultaneously, with Collaborative Director Judy Morton also serving as the interim director of the MSEC until August 1986, when Dr. Paul Markovits was appointed. Although the collaborative was under the auspices of the MSEC, Judy Morton operated somewhat independently from Dr. Paul Markovits, since both directors were working to establish the organization for which they were responsible.

Dr. Markovits is supported by a Board of Directors and two advisory committees, one for mathematics and one for science. Because the central focus of the MSEC is on all the school districts in the greater St. Louis area, the collaborative's focus on mathematics teachers in the St. Louis Public Schools addressed only one aspect of the MSEC's mission. This restricted target audience affected how the collaborative was viewed within the MSEC organization and the amount of time and attention that its director could give to the operations of the collaborative.

Although in theory the MSEC's director and its Board of Directors had final authority, in practice the collaborative and its budget were administrated autonomously by Ms. Morton and the Collaborative Council, the collaborative's governing and programming body. The Council, which was formed in November, 1986, was to be comprised of educators from the SLPS and two representatives each from the academic, business, and scientific communities. The Council, however, had difficulty identifying representatives from the business and scientific communities to serve, and not until the second year was a business representative added to the Council. Over a period of time, the Council added more active and committed teachers and one or two representatives from business or higher education. The Collaborative Council operated as the only governing group over the entire documentation period. The permanence proposal indicated that a second group, a collaborative board of directors, would be created to make policy decisions and to gain the involvement of people in influential positions.

The conscious decision that the collaborative be planned *by* teachers *for* teachers was made during the initial stages of collaborative development. The planning committee included seven teachers and the principal of the Gifted Program at a regular high school, along with the interim director of the Mathematics and Science Eduction Center, Judy

Morton, two staff members from the St. Louis Public Schools, and a mathematics coordinator from the St. Louis County Schools, who served as a consultant.

The administration of the collaborative has undergone continual change over the life of the project. Initially, direction for the project was provided by a four-member team comprised of Ms. Morton, director of the Partnership Program Wayne Walker, and the two mathematics supervisors from the SLPS Curriculum Division, along with the Collaborative Council. Ms. Morton was assisted by a part-time administrative assistant who assumed the title of coordinator and a half-time secretary provided by the MSEC. In 1988, the MSEC's Board of Directors combined the positions of the collaborative director and of mathematics coordinator for the MSEC into a single full-time position for which Ms. Morton chose not to apply. Dr. Helene Sherman was appointed collaborative director and MSEC mathematics coordinator. Dr. Sherman was assisted by Anita Madsen, who continued to teach full-time while serving as chair of the Collaborative Council. During her year as director, Dr. Sherman strengthened the interchange of plans and ideas between MSEC and the collaborative. In May, 1989, Dr. Sherman resigned her position to accept a position at the University of Missouri-St. Louis.

In August, 1989, Jerome Burke, who had previously been one of three mathematics supervisors for the SLPS, filled the position of collaborative director/MSEC mathematics coordinator until August 1990, when he took a teaching position at Normandy Senior High School. Mr. Burke was assisted by Anita Madsen, a half-time secretary, and two part-time collaborative coordinators who were appointed between February and May, 1990: Cyrus Rogers (a teacher from Stowe Middle School) and Gloria Clark (a teacher from the Center for Management, Law, and Public Policy, a secondary magnet program).

Even though the Collaborative Council was to make the major decisions for the collaborative, the collaborative's first director did not share budget information with the Council until close to the end of her employment. Thus, it was more than two years before the Council was able to make decisions based on knowledge of the budget. Council decisions were made through discussion and by vote if needed; ad hoc committees were formed to address issues or perform tasks that arose from the discussions. Membership continued to grow as the Council maintained its teacher-centered identity. One business representative became very active on the Collaborative Council, and, toward the end of the 1989-90 school year, efforts were made to recruit others from business and industry.

While the higher education representatives maintained interest in the collaborative, they became less active in the Council over time.

The consistent effort to make teachers central to collaborative decision-making resulted in a core of approximately 20 to 30 teachers who felt strong ownership in and commitment to the collaborative, to the extent that other teachers perceived the collaborative as exclusive to this very active group. While their level of commitment was praiseworthy, when the time came to write a permanence proposal, these teachers had not developed strong links with the school district's administration and representatives from the business and higher education community; the collaborative was not well-rooted in the community.

Through the intervention of the EDC, Dr. George Hyram, Vice President Emeritus at Harris Stowe College and well-respected by the teachers, was hired as a facilitator to help build stronger community relationships. Rather than serve as a catalyst in bringing people together, which had been achieved by similar interventions in other collaboratives, Dr. Hyram served more as an evaluator offering a critique of the collaborative and its position. For over a year, the collaborative administration sent EDC proposal drafts, which EDC returned with comments and reactions that sought from the collaborative specific plans to increase the number of involved teachers, strategies to gain greater community support, and evidence of a clearer commitment from MSEC to serve as the host agency or, in lieu of that, specific plans for acquiring a different host agency.

A permanence proposal was finally approved in May, 1990. It included changing the collaborative's governance structure to create a Board of Directors that would consist of 11 members elected by the collaborative's general membership: 6 teachers, 2 business and industry representatives, 2 representatives of higher education, and 1 school administration representative. Terms of office would be staggered to provide continuity. An Advisory Council would be established to offer suggestions on programs and activities. The proposal also made provisions for the appointment of a full-time chief administrative officer to direct the collaborative.

E. Project Activities

Over the four-year period 1986-1990, the St. Louis Urban Mathematics Collaborative sponsored a wide variety of activities for secondary mathematics and computer science teachers in the St. Louis Public Schools and, beginning in the 1988-89 school year, for middle school teachers. The Collaborative Council, comprised largely of teachers, has assumed responsibility for determining the collaborative's programming and for planning its activities.

The range of the St. Louis collaborative's activities addressed the four themes that had emerged from the documentation process as being dominant in collaborative programming. These themes were: Socialization and Networking, Increased Knowledge of Mathematics Content, Teacher Professionalism, and Teacher Leadership. Socialization and Networking activities, especially prominent in the formative years of the collaboratives, were designed primarily to initiate interaction among teachers and between teachers and mathematicians from business and higher education. These generally large-group activities were important to a collaborative's evolution since they brought members of the mathematics community together, enabled them to get to know one another, and promoted networking. The second theme, Increased Knowledge of Mathematics Content, encompassed activities designed to provide teachers with mathematics-directed experiences and to increase the knowledge of teachers and others regarding current trends in mathematics and mathematics education. Many of these activities helped to activate the agenda of the mathematics reform movement at the collaborative sites. The third theme, Teacher Professionalism, emerged in activities structured to enhance teachers' conceptions of teaching as a profession. Collaboratives provided opportunities and incentives for teachers to attend professional organization meetings and made mathematics teachers aware of available grants and other opportunities for professional development. Some collaboratives paid teachers' dues for organization membership and arranged for teachers to observe other teachers and reflect on their teaching. The fourth theme, Teacher Leadership, had not been identified at the beginning of the UMC project, but gained greater attention as collaboratives found that teachers lacked the skills needed to organize professional efforts, to plan, and to develop the power within their group to generate systemic change. This theme was advanced by the EDC through the UMC Teacher Leadership Workshops which, beginning in the summer of 1989, were attended by from one to four teachers from each of the collaboratives. However, since this training was

initiated by EDC rather than by the collaboratives, it is not discussed in the reports of the individual collaboratives.

In reflecting on collaborative activities as they related to the four themes, considerable overlap was noted, since most activities served multiple purposes. A single activity may therefore be discussed under several headings.

Socialization and Networking

One of the four primary goals of the St. Louis Urban Mathematics Collaborative is to improve communication and exchanges of information among the mathematics teachers within each school and across schools. As a result, four programmatic efforts were designed specifically to promote communication and networking: Socials, Dinner Symposia, the *Teacher Directory*, and the distribution of the *Collaborative Newsletter* and the Collaborative Council Minutes. It should be noted that, unlike other collaboratives, the St. Louis Collaborative did not focus its efforts on attracting representatives from the business and higher education community to its social events.

Socials

Beginning in April, 1987, and continuing every year after, the collaborative sponsored social activities to enable mathematics teachers to become better acquainted with one another. The collaborative's first such event, an after-school gathering at the Forest Park Hotel, was designed to provide an opportunity for teachers to socialize with each other as well as to learn about the benefits of collaborative participation. During the 1987-88 school year, the collaborative sponsored three events geared toward providing mathematics teachers and administrators an opportunity to meet and network outside the work setting--a Fall, a Winter, and a Spring Social. These programs also served to attract teachers who had not previously participated in collaborative activities. The collaborative sponsored two social events during the 1988-89 school year--a Holiday Social and a Spring Social. Middle school teachers, who were new to the collaborative, were invited to attend the 1989 Spring Social. During the 1989-90 school year, the collaborative sponsored two

sharing/professional "interaction" sessions for secondary and middle school mathematics teachers and district administrators--a "Welcome to the New School Year Picnic" and the Spring Informal Professional Interaction Group. The picnic was planned by a teacher to provide an opportunity for teachers who had received collaborative funding for professional activities during the summer to share their experiences, as well as to provide a setting for informal interaction. Copies of the working draft of the NCTM Professional Standards for Teaching Mathematics were distributed at the spring session. The socials were an important part of collaborative programming, and teachers commented repeatedly that they looked forward to these opportunities to get together and to talk with other teachers.

Dinner Symposia

The collaborative sponsored three successful dinner meetings during the four-year period. The events were seen as opportunities for mathematics educators to network professionally and to stay motivated and abreast of the latest trends in mathematics. The first dinner symposium, which was held in May, 1988, and attended by 65 secondary mathematics teachers and administrators, was co-sponsored with IBM. The program, "The Changing Mathematics Classroom: The Influence of New Technologies," addressed the ways technology is changing mathematics at the secondary school level and techniques teachers can employ in using the new technologies to their advantage in mathematics classrooms. The IBM *Mathematics Exploration Toolkit*, a software package for graphics, was also presented. A second symposium, held in February 1989, addressed the cognitive development of children, the software and methods that could be used to enhance it, and what is being done in England to improve mathematics. Attendance at the event was somewhat lower than anticipated, with only 32 teachers and administrators participating. It was suggested that the ambiguous title for the symposium, "Ifing and Becausing: The Real Basics in Children's Thinking," may have discouraged some teachers. The third dinner symposium, "Problem Solving in the Curriculum, Correlated to 'Someone told me the Answer'--Are our Students REALLY Afraid to Think," was held in May, 1990. Originally, attendance was to be limited to the first 35 people to make reservations, but due to the interest shown, capacity was increased to accommodate 50 people.

Teacher Directory

In the spring of 1988, the collaborative published a teacher directory listing the name, school, school phone number, and home address of all secondary mathematics teachers who agreed to participate. Optional information included special areas of expertise, mathematics seminars or lectures presented (or prepared to present), home telephone number, and favorite hobbies. The booklet was made available free of charge to all St. Louis Public School secondary mathematics teachers. The collaborative staff felt that publishing the *Teacher Directory* was an important step in facilitating networking across schools.

Council Meeting Minutes and the *Collaborative Newsletter*

As part of its effort to improve communication among all mathematics teachers and to stimulate teacher interest in the collaborative, the minutes of the monthly Collaborative Council meetings were distributed to each mathematics teacher as well as to school administrators. The minutes kept the teachers apprised of collaborative events and activities. During the 1986-87 school year, the collaborative investigated the possibility of publishing a newsletter. A single issue of the St. Louis *Collaborative Newsletter* was published in mid-March 1987, with 150 copies distributed among department heads to be given to teachers in their departments. The publication of the newsletter did not continue. Instead, collaborative information was disseminated to teachers though publications of the St. Louis Public Schools district as well as through the minutes of the Council meetings.

Increased Knowledge of Mathematics Content

Over the four-year period, the St. Louis Urban Mathematics Collaborative offered teachers programs directed at expanding their knowledge about mathematics and the mathematics reform movement. The collaborative did not develop a strong mathematics focus, but instead followed a more general approach to mathematics education that involved a variety of topics related to mathematics teaching. The emphasis of many of the collaborative's programs, especially toward the end of the four-year

period, originated with the mathematics supervisor and her initiatives in reforming the mathematics program in St. Louis. Collaborative programming included a variety of workshops and seminars, as well as a cooperative effort for inservice programs with the St. Louis Public Schools. The collaborative sponsored teacher attendance at a wide range of workshops and seminars sponsored by other institutions, including many offered by the Mathematics and Science Education Center. Teacher awareness of topics in mathematics education was also enhanced at the three dinner symposia discussed in the previous section.

Collaborative-Sponsored Workshops and Seminars

Each year the collaborative sponsored a variety of workshops and seminars to expand teachers' knowledge of mathematics content. During the 1987-88 school year, the collaborative sponsored two workshops on mathematics content. The first was a two-day program, "Challenge of the Unknown Film Series," held in February, 1988, that was designed to improve teachers' problem-solving skills and enhance creative approaches to teaching mathematics. The second, a one-week workshop in June, 1988, was co-sponsored with the St. Louis Public Schools and the North Carolina School of Science and Mathematics (NCSSM) and focused on the Introduction to College Mathematics materials that had been produced by NCSSM. The workshop was taught by four secondary teachers, including two from the St. Louis Public Schools, and covered various mathematics topics that use the computer as an aid to problem solving, including geometric probability, data analysis, matrices, and functions. Each of the two workshops was attended by ten teachers and two administrators. The teachers who participated reported that the workshops were very worthwhile and that they gained many useful ideas.

During the 1988-89 school year, the collaborative sponsored two seminars that focused on mathematics education in other countries. The seminars, which were attended by an average of 17 participants, were designed to provide teachers with an international perspective on mathematics education.

In August, 1989, the collaborative sponsored a two and one-half hour seminar series on four different afternoons. The series, "The Computer and Your Curriculum," was designed to assist teachers in implementing the new mathematics curriculum and

included information on incorporating the use of computers and software that the district had purchased along with the new textbooks into their classroom presentations. The seminars were taught by two collaborative members. Only five or six people participated each day; the poor attendance was attributed to some confusion as to whether the seminars would be offered, since asbestos was being removed from the building in which the seminars were held.

Inservice Programs

The collaborative has had a direct impact on the inservice programming the St. Louis Public Schools offers to mathematics teachers. Teachers have noted that before the collaborative was formed, inservices were typically held in the schools, and no meals were served. The collaborative has been credited with being a factor in the improved programming and atmosphere for inservice meetings.

In January, 1989, the St. Louis Public Schools held an inservice for secondary mathematics teachers that was planned by the district mathematics supervisor with recommendations from collaborative members. The conference, which was funded with Title II monies and financial assistance from the publisher D.C. Heath and from IBM, was designed to aid teachers in implementing the new curriculum and in increasing their use of videos and calculators in their classrooms. The workshop featured a speaker on the IBM *Mathematics Exploration Toolkit*; the mathematics supervisors invited him to speak after hearing his presentation at a previous collaborative function.

In January, 1990, the St. Louis Public Schools, in cooperation with the collaborative, sponsored Title II inservice programs for St. Louis middle school and secondary school mathematics teachers. The program for the secondary teachers was held in the morning, while the middle school inservice program was held in the afternoon. Approximately 100 secondary teachers and nearly 65 middle school teachers attended the inservice, as well as 20 representatives from business and industry and 3 from higher education. The format of the inservices, a choice of attending two of three workshops and the opportunity to visit booths and displays, reflected teachers' evaluations of the 1989 inservice, in which they requested smaller sessions and an exhibit area. The workshops

offered at the Secondary Inservice Program were: "Integrating Problem Solving into the Teaching of Algebra and Geometry," "Activities and Applications Using the Scientific Calculator Casio Model fx-115," and "An Introduction to the Graphing Calculator Casio Model fx-7000G." The workshops offered at the Middle School Inservice Program were: "Enhancing MMAT Skills Through Problem-Solving Activities," "Developing Test-Taking Skills Through Problem Solving and Critical Thinking," and "Activities for Implementing New Curriculum and Evaluation Standards."

Workshops and Seminars Sponsored by Other Institutions

As part of its efforts to increase teachers' knowledge of mathematics content, the collaborative sponsored teachers' attendance at a variety of workshops and seminars, including those offered by the Mathematics and Science Education Center. On March 31 and April 1, 1987, for example, the collaborative paid all but $5 of the teachers' registration fee for a MSEC seminar on discrete mathematics. The Center paid for substitute teachers. The collaborative supported teachers' attendance at a Center-sponsored seminar on the EQUALS Program May 1-2, 1987, at an MSEC workshop "Using Manipulatives for In-Depth Concept Development" in October, 1988, a two-day workshop on the "Challenge of the Unknown" Film Series in February, 1988, and an all-day seminar, "Activities for Data Collection with Calculators and Computers," sponsored by the MSEC in February, 1989.

In 1987-88, the collaborative established a Conference and Seminar Committee to identify local seminars and workshops most relevant to the collaborative's goal and to establish criteria for selecting teachers to receive collaborative funding to attend. During 1987-88, five seminars were selected: Estimation and Mental Computation; Teaching with the *Geometric Supposer*; The Way to the Math Solution; the Midwest Education and Technology Conference; and the Statistical Conference held at the Network for Education Development. Approximately 25 collaborative teachers received funding to attend one of these five seminars. The collaborative also contributed $1,400 in travel expenses for three representatives to attend a workshop in Chicago on using the Transition Mathematics and Algebra materials developed by the University of Chicago School Mathematics Project.

Teacher Professionalism

The collaborative has provided mathematics teachers in St. Louis with opportunities for professional growth that were not previously available to them. Among these are site visits, access to grant programs, participation in professional organizations and conferences, opportunities to promote recognition of the accomplishments and professional quality of mathematics teachers, and assuming responsibility for professional development programs for themselves and their peers, as well as increasing community recognition of the teaching profession.

Site Visits

As part of its goal to help teachers explore potential resources in business and industry in an effort to discover how these resources could assist them in their own professional growth and classroom instruction, the collaborative sponsored four site visits to area businesses. Three of the visits were held in the summer of 1986, and the fourth was held in the summer of 1988. Five teachers participated in each site visit. The site visits provided teachers with an opportunity to see how mathematics is used in the workplace, and also gave teachers the chance to observe other professionals engaged in their work activities. The site visits in the summer of 1986 were very successful, while the site visit in summer of 1988 was attended by only three teachers. The teachers who participated, however, felt that the visit was very worthwhile. Two other site visits that had been planned for the summer of 1988 were canceled due to poor teacher response.

Grant Programs

Throughout its development, the collaborative has informed teachers about the availability of grant programs and offered teachers support in submitting proposals. In December, 1986, and again in January, 1987, the collaborative sponsored grant-writing seminars. In 1990, the Collaborative Council developed and submitted a proposal to the UMC Outreach Project at EDC. The two main goals of the proposal were to further curriculum reform by forming a network of teacher-trainers and helping to reshape the district's curriculum; and to assist in implementing staff development programs by

developing a college course, preservice and inservice workshops, and preparing a resource book focusing on the NCTM *Curriculum and Evaluation Standards*. Although the proposal was not funded, the collaborative was promised a grant of $1,000 towards the project if the remaining funding could be raised from other sources.

Professional Organizations and Conferences

The collaborative has successfully encouraged teachers to become more involved in professional meetings and organizations. As part of its effort to promote the professional development of teachers, the collaborative supported teachers' attendance at a variety of local, regional, and national conferences, including the 1988, 1989 and 1990 Annual Meetings of the National Council of Teachers of Mathematics (NCTM) in Chicago, in Orlando, Florida, and in Salt Lake City, Utah; the 1988 Central Regional NTCM Conference in St. Louis; the 1989 Fall Conference of the Missouri Council of Teachers of Mathematics in Columbia, Missouri; a weekend program in Dallas to train teachers to develop partnerships with business and to strengthen partnerships that are already established at their schools, sponsored by the National Association of Partners in Education; "State of the Art Presentation Skills," a two-day workshop offered by the Network for Educational Development, in October, 1989; the Interface 86 and Interface 90 Conferences sponsored by the Missouri Department of Elementary and Secondary Education; and the national convocation, "Making Mathematics Work for Minorities," sponsored by the Mathematical Sciences Education Board in Washington D.C. in May, 1990.

Visit With Uri Treisman

One area of collaborative interest is the teaching of mathematics to special groups, such as minorities and women. In March, 1988, the collaborative sponsored a visit from Dr. Uri Treisman, a professor of mathematics at the University of California-Berkeley who also taught several high school mathematics classes. Dr. Treisman visited with collaborative teachers, both demonstrating methods of helping students work together successfully and leading a seminar, "Structuring Effective Study Settings for Minority

Students." His visit helped to raise issues related to teaching mathematics to minorities through group work.

Teacher-of-the-Year Award

In 1988-89, the collaborative initiated the Gus Clark UMC Outstanding Teacher-of-the-Year Award. The award, named after a dedicated mathematics teacher in the St. Louis Public Schools who passed away suddenly, was designed to promote the recognition of quality performance and the accomplishments of mathematics teachers. The award program was very well received by the collaborative teachers, who were accustomed to working in an environment with little positive external recognition. The selection of the Teacher of the Year was based on balloting. The 1989 Award was presented following a collaborative seminar, while in 1990, the Council, acting on the suggestions of teachers, presented the award at a dinner symposium. In addition to presenting the award for the Teacher of the Year, the collaborative recognized several other outstanding members of the collaborative at the dinner.

Assuming Responsibility for Peer Staff Development

Through their role on the Collaborative Council, teachers in St. Louis assumed responsibility for planning professional development programs for their colleagues. Members of the collaborative's Conference and Seminar Committee identified seminars and workshops for which the collaborative would offer teachers financial support and established criteria for selecting the teachers to receive funding. In addition to enhancing professional development through their work on the Collaborative Council, several teachers were presenters at collaborative programs. The August 1989 seminar series, for example, was taught by two collaborative members. Not all of the collaborative's programming efforts to provide staff development were successful, however. During the 1988-89 school year, the collaborative initiated the formation of subject area study groups designed to focus pedagogy on the new curriculum. Several study topics were established, including General Mathematics and Applied Mathematics; Advanced Algebra, Elements of Mathematics, and Geometry; Trigonometry/Analytic Geometry; Algebra; and Calculus.

Poor teacher response to the study groups forced cancellation of the program after the second meeting.

Veiled Prophet Fair

As part of its efforts to promote mathematics to the general public and to support the teaching profession, the collaborative participated in the community-wide Veiled Prophet Fair in 1989, a popular Fourth of July celebration held on the grounds of the Arch near the riverfront. The collaborative sponsored a booth on Education Day, in a section reserved by the Mathematics and Science Education Center. Visitors to the booth could play mathematics games and pick up pamphlets about games and computer activities, as well as a collaborative brochure. The booth, which was visited by hundreds of people, was very popular, and the collaborative anticipated participating in successive Veiled Prophet Fairs.

Teacher Leadership

Teachers who served on the Collaborative Council were central to the operations of the collaborative and were able to assume leadership roles in developing the collaborative's programming. Two programs in particular, the Mathematics Fair and the Secondary Mathematics Contest, are viewed as significant in terms of the overriding goals for the UMC project. These activities, initiated by the Collaborative Council, were planned by teacher committees and drew on support from area businesses, either through direct participation in the program, or through financial contributions. Both the Mathematics Fair and the Secondary Mathematics Contest have proved successful, benefiting students and serving to highlight mathematics in the eyes of teachers, students, district administration, and the community. These activities united teachers who had not previously worked together in the context of the collaborative structure and required that they learn how to use resources in the community to further educational goals. They demonstrate how the teachers in the St. Louis collaborative took charge of improving their own environment.

Mathematics Fair

The Mathematics Fair was initiated in March, 1988 to foster creativity and the development of problem-solving skills, as well as a general interest in mathematics, among high school students. The three-day Fair, which has become an annual event, exhibits projects of secondary mathematics students in the St. Louis Public Schools. Representatives from business, industry, and the local NCTM affiliate serve as project judges and computer judges, along with teachers and school administrators. In addition, representatives from all sectors play a key role in the awards ceremony, held on the last day of the Fair. While the collaborative had allocated funds to cover expenses for the Fair, including prizes, materials, bus transportation, and substitute teachers, the funds were not needed--donations from eleven area industries and the St. Louis Public Schools Partnership Program financed the 1989 Fair, and General American Life Insurance Company, in response to a proposal submitted by the collaborative's Mathematics Fair Committee, agreed to be the corporate sponsor for the 1990 Fair, granting the committee $12,000 in funding.

Each year, the number of exhibits has increased substantially; at the 1990 Mathematics Fair, there were over 200 individual projects, as compared with the 148 projects on display at the 1989 Fair, and the 88 projects at the 1988 Fair. In addition to the large number of elementary, middle, and high school students who visit the Fair to see the projects on display, the Fair attracts a large audience of teachers, school administrators, and members of business and industry. The Fair has become an impressive event. Teachers consider it to be ". . . the best idea to come out of the collaborative."

Secondary Mathematics Contest

The collaborative initiated the Secondary Mathematics Contest in the spring of 1988 and, since then, the contest has become an annual spring event. The contest was designed to stimulate student competition between the area high schools and encourage the study of advanced mathematics, as well as to improve students' test-taking skills and SAT scores. The contest, which is planned by a teacher committee that meets numerous times over the year, is co-sponsored by the collaborative and six area businesses. Each St. Louis high school is invited to enter eight students, two per grade level, to compete for team,

school, and division awards. Participation in the Mathematics Contest has been increasing steadily, and by 1990, 112 students representing 14 high schools participated. As with the Mathematics Fair, representatives from the school district and area businesses and industries not only provide financial support, but participate in the program.

F. Reflections

The intent of the St. Louis Urban Mathematics Collaborative to form an organization by teachers for teachers was consistent throughout the period of documentation. The collaborative continued to offer teachers professional development opportunities, to inform them of special programs and current trends, to provide a mechanism to coordinate programming for students, and to sponsor networking events for teachers. The approach to strong teacher participation in organizing the collaborative has had both positive and negative aspects. Through the numerous changes in directors, the collaborative has sustained its activities because of the committed teachers who understood the operation of the collaborative. Although not responsible for the day-to-day administration of the collaborative, these teachers have learned how to work together to initiate a program, as demonstrated by work on the Mathematics Fair and on the Secondary Mathematics Contest. The existence of this active core of teachers, however, has caused some other teachers to feel excluded. Furthermore, it seems apparent that Council meetings dominated by teachers tend to focus on discussion, rather than on decision-making, in contrast to meetings orchestrated by business people who structure the agenda to focus more on making decisions. One priority is the need to draw a greater number of members of the business and higher education communities into collaborative activities. Not having representatives from these sectors actively involved has dampened the Council's ability to benefit from the wide range of expertise available from individuals active in business and higher education, as some of the other collaboratives have done. This teacher-driven collaborative has had an impact on the educational environment in the area through a relatively small group of individuals, but has had difficulty developing strategies to sufficiently engage a larger proportion of the target population as well as the broader community.

The greatest success of the St. Louis Urban Mathematics Collaborative has been an unprecedented networking and bonding among a group of mathematics teachers, resulting

in a more concerted effort, according to one district administrator, than has been seen in any other content area. The collaborative's activities have provided teachers with a national perspective on mathematics and an expanded understanding of teaching practices that have translated into greater classroom use of computers and cooperative learning groups. The collaborative teachers have increased their enthusiasm for teaching and are more willing to try new ideas. The mathematics supervisor observed that collaborative teachers are exerting greater leadership than in the past. A business associate has noted an improvement in teacher confidence. Others have observed that teachers have a greater respect for their profession. In addition, the collaborative has had an impact on students who are becoming excited about mathematics and taking a greater number of higher mathematics courses. A teacher of 40 years noted that the collaborative has made her much more aware of problem-solving techniques that go beyond the textbook. She has raised her expectations for her students and now expects all her students to have two years of algebra. There is also some indication that the increase in the number of students taking higher mathematics can be attributed to the increase in teachers' expectations and knowledge of the need for more mathematics. The accomplishments of mathematics teachers within the district is seen as a model that could be followed in other content areas. Thus, the collaborative has served as a model and proving ground for the district.

Throughout its development, the St. Louis Urban Mathematics Collaborative has had difficulty in two respects--continuity in leadership and mission. Over a four-year period, the collaborative had three directors with the third one leaving at the end of the fourth year. This lack of continuity in leadership has contributed to a lack of focus in addressing the need for a mathematics collaborative in the area and in making the links to the other sectors. Adding to this difficulty, the collaborative's host agency, the Mathematics and Science Education Center, was also trying to establish itself and thus was unable to provide the continuity needed for the advancement of the collaborative. The goal of the St. Louis Urban Mathematics Collaborative was to create an organization of teachers for teachers and this is indeed what has been achieved: an umbrella organization that has conducted or supported many activities involving teachers. What has not evolved is a strong sense of mission for this teacher-driven organization. This, along with the lack of continuity in administration, has meant that the collaborative has not done the strategic planning necessary to the articulation of a larger mission and the means by which it will generate support in achieving this mission.

In hindsight, the collaborative could have benefited from a viable policymaking board that did some of the strategic planning, provided continuity during the changes in the directors, and formed links with critical community organizations. The MSEC Board of Directors could have served this purpose, but its members were too occupied with the development of the MSEC to provide the collaborative with the needed direction. The collaborative also needed some mechanism for outreach, so that a greater number of district mathematics teachers could be brought into the collaborative process. This might have been done by rotating positions on the Collaborative Council or having some system to ensure that teachers at each school were reached. Although attempts to do this were made, the collaborative was unable to overcome a lack of interest by a significant percentage of teachers. But even without a strong strategic planning effort and a means for expanding the number of those involved, the St. Louis Urban Mathematics Collaborative has achieved significant outcomes.

Collaboration Outcomes

Understanding of the collaborative process is increasing with each year. The major energy behind collaboration in St. Louis comes from Council members, but the dynamics of collaboration extend beyond this group. The committees that plan the Mathematics Fair and the Secondary Mathematics Contest are also developing cooperative working relationships with people from the business community and with the administration of the SLPS, either as speakers or donors of funds. These two events serve to highlight mathematics as an occasion for collaboration in the eyes of teachers, students, administration, and the community. The Fair has brought increasing involvement from universities, whose representatives participate as judges, and it has generated positive media exposure, a rarity for the St. Louis Public Schools.

Another form of collaboration involves the mathematics supervisor who now has a group of collaborative teachers to draw from for committee membership. She is also using resources from business and higher education institutions in the region when she plans events, the district's January 1990 inservice being a case in point. Teachers viewed these inservice workshops in a more positive light than some of inservice programs they had attended in the past.

The St. Louis collaborative has matured to a point at which members know they can be successful working together and hosting events. This is a critical stage in the evolution of all of the collaboratives. For some it has taken a year. For others, it has taken much longer. It seems that conditions are such that another stage of development within the St. Louis collaborative, such as identifying specific issues and problems facing mathematics teachers and working to solve these, may be imminent. Teacher isolation could be one of the issues addressed at this stage.

Professionalism Outcomes

The St. Louis collaborative was formed in the mid-1980s, at a time when there was local pressure to evaluate teachers on the basis of their students' performance on standardized tests, with little control by teachers over course content--a state of affairs conducive to low teacher morale. The district discouraged teacher participation in professional activities that would remove them from the classroom. In St. Louis, this professional environment was ameliorated to a degree over the period of documentation due to two factors: (1) the union's action on the issue of teacher evaluation, and (2) teachers' input into district decisions, even if only from the periphery.

The collaborative has served as a proving ground for new ideas. It has given the mathematics supervisors support and a vehicle for trying ideas that would not have been possible within the standard structure of the mathematics program in the district. In 1988-89, the collaborative director, along with the mathematics supervisor, tried to organize subject area study groups, each focusing on issues related to a particular mathematics course. These groups did not succeed because very few teachers participated. However, in September, 1989, with the support of the mathematics supervisor, the department heads were encouraged to form small clusters of teachers at each school to share strategies and to develop recommendations for curriculum modifications. In October, 1989, the on-site observer reported that department meetings had changed: "Department meetings are now more meaningful. Along with routine school business, problems in teaching mathematics are now discussed."

In response to the second Survey of Teacher Professionalism, administered in 1990, teachers participating in the collaborative portrayed themselves as quite dedicated to their

work, which they universally saw as being of great value to society. They were, however, less convinced that this value was recognized by the community at large: indeed, some 60 percent did not perceive that there was sufficient recognition of teachers in the community, which is consistent with findings at the other UMC sites.

Virtually all respondents felt that, in general, the mathematics teachers in St. Louis had sufficient control over their day-to-day decisions. This observation might be seen in relation to their views about appropriate levels of professional autonomy. Over one-half of those responding to the survey were at best neutral in regard to the proposition that the prime responsibility for self- and peer evaluation should reside with mathematics teachers themselves. Further, one in five did not believe that the professional organizations should take responsibility for setting standards and for the implementation of reforms. It must be noted that level of involvement in the collaborative is quite strongly related to a more positive view of the responsibilities of these professional bodies. There is also a clear relationship between level of involvement in the collaborative and the perceived valuing of the professional organizations and their publications and meetings. About one-third of all teachers either did not use, or did not see the relevance of professional organizations to ordinary teachers. The reason why so many teachers do not value professional organizations is a matter for speculation. It may be related to teachers' confinement to their classrooms and to the lack of opportunities within the district to become more professionally involved.

The permanence proposal submitted by the St. Louis Urban Mathematics Collaborative to the Ford Foundation in April, 1990, lists a number of the collaborative's accomplishments, many related to increasing the professional growth of mathematics teachers. Members reported that the collaborative has affected the intellectual growth of teachers and that teachers have become more active professionally through participation in symposia, workshops, lectures, and conferences. They also seem more willing to apply for grants, to get involved in decision making, and to try to influence the planning and programming for the district's inservice programs. What the proposal does not report, and what is not very clear, is the total number of teachers who have been affected by the collaborative in this way.

Mathematics Focus Outcomes

The St. Louis Urban Mathematics Collaborative does not have a well-defined mathematics focus. The Mathematics Fair and Secondary Mathematics Contest, the two most prominent functions sponsored by the collaborative, are directed toward improving students' interest in mathematics. The goal of the Mathematics Fair is to foster creativity, problem-solving skills, and interest in mathematics. The goal of the Contest is to improve test-taking skills and SAT scores. Although both highlight areas on which to focus, they are not viewed as a means of increasing teachers' knowledge of mathematics or enhancing the skills of mathematics teachers.

The mathematics focus that the collaborative has achieved can be attributed to the mathematics supervisor and her initiatives in reforming the mathematics program in St. Louis Public Schools. In 1989-90, district mathematics activities centered on using technology and problem solving in the classroom. An August computer seminar was sparsely attended. The January district inservice included sessions on teaching problem solving in algebra, the use of both scientific and graphing calculators, enhancing mathematics skills through problem solving and critical thinking, and the NCTM *Curriculum and Evaluation Standards for School Mathematics*. The May dinner meeting featured a talk on problem solving in the curriculum. These activities increased the awareness of teachers that mathematics is more than computation skills and provided them with information on how new technology can be applied to teaching.

Perhaps the greatest gain the collaborative has made for mathematics education in the district is to render it more visible to the teachers, their students, the district administration, and the community. Having highly visible events such as the Mathematics Fair and the Mathematics Contest have contributed to this result. Elements of curriculum reform were apparent with the initiation of the new curriculum in 1988-89 and the emphasis on encouraging more students to take algebra. At least some of these changes have come about because the mathematics supervisor, Winifred Deavens, had the support of the collaborative and because she was actively participating in the national UMC network with other mathematics supervisors. Incremental change in mathematics education in the St. Louis Public School district is apparent, and the collaborative has been influential in achieving this.

Conclusions

The St. Louis Urban Mathematics Collaborative has struggled throughout its existence with finding stable leadership, with establishing a coherent mission, and with developing broad community support. A small but expanding group of committed teachers has worked diligently during this time discussing issues, deciding on programs, and coordinating activities. These teachers have received the cooperation of district administration, academicians, and business people who have given their time and financial support to these activities. These teachers, and others who have participated in the collaborative's activities, have increased their enthusiasm toward their profession, are more aware of current trends in mathematics education, feel a greater alliance with other teachers, and in a few cases, have changed their teaching practices. One business associate has been faithful in his participation in Collaborative Council meetings and other collaborative activities. A few representatives from higher education have invited St. Louis Public School teachers to participate in projects they are conducting on their campuses. The district administration has come to view the mathematics collaborative as an experimental agent for trying new ideas that may be applicable in other content areas. The mathematics supervisor has turned to active collaborative teachers to provide leadership.

Beginning as an organization by teachers for teachers, after four years of experience, the collaborative has become more sophisticated in recognizing the responsibilities of a viable mathematics education organization in the St. Louis area. Most impressive has been the lasting commitment of the core of teachers who helped to initiate the collaborative, and who have continued their level of participation, a testament in and of itself of the high value these teachers place on the collaborative.

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